Appendix C

Fire Barrier Analysis

Fire Barrier Analysis

State Route 24 as a Barrier Against Fire

Barrier

Prevention- precut fire breaker and/or burn tumbleweed and vegetation along state right-of-way shoulder between SR 24 and the DOE fenceline.

Discussion

Precut firebreaks, "green belting" and/or burning off vegetation along right of way may have separated vehicular accident fire from spreading to ALE Reserve and DOE property.

Evaluation Failed/ Success

Failed-The barrier was last completely burned off in 1995 by a controlled burn.

Analysis

While this barrier (shoulder right-of-way vegetation burn off) was last time in place in 1995, it was not maintained along the entire lengths of SR 24, and vegetation reseeded enough to yield readily available fuel, allowing the fire to spread from the vehicular highway fire to vegetation on-site. Maintenance of this barrier may have prevented the fire that started on the highway from igniting the natural vegetation on the ALE Reserve.

Impacts

Firebreaks were cut each year as a lesson learned from the 1984 Hanford Range Fire. The disking firebreak practice was discontinued due to allegations of fugitive dust problems made by the Benton County Clean Air Authority (BCCAA) created from the disking. In 1995, after reading the fugitive dust complaint, the RL Environmental Office (concurred by the RL Office of Chief Counsel) sent a letter to the BCCAA stating that the disking of firebreaks would be discontinued. Preburning of vagrant tumbleweeds was conducted along right of ways along SR 24 and SR 240 following the discontinuance of disking firebreaks. However, due to changes in Washington State Clean Air Act legislation passed in late 1995, additional restrictions were placed on open burning, and the practice of burning the entire lengths along SR 24 and SR 240 was discontinued. Permits obtained from the BCCAA by the Washington State Department of Transportation for burning the vegetation along the state-controlled right of ways was limited to small acreage sizes, and only tumbleweeds were allowed to be burned These pre-readied widened firebreaks made by burning areas along SR 24 and SR 240 were completely burned off for the last time in 1995. The pre-readied firebreaks were not maintained, and vegetation reseeded enough to permit the fire ready available fuel to spread from the vehicular highway fire to vegetation on the Site. When the accident occurred along SR 24, readily available natural vegetation along the highway shoulders quickly caught fire, which spread onto the Site.

Fire Barrier Analysis

State Route 24 as a Barrier Against Fire (contd)

Barrier

Suppression

Discussion

Manual fire suppression along major road ways via fire department rolling stock and firefighters supplemented by aerial vehicular fire retardant drops.

Evaluation Failed/Success

Successful in many locations and unsuccessful in other locations where access and direct attack were impossible and the wind coupled, with the dry vegetation, accounted for the tremendous intensity and speed with which the fire traveled.

Analysis

Manual fire suppression of wildland fuel was accomplished primarily off-road via pumper/tankers and fire department grass rigs at fire fronts and flanks. This was supplemented by aerial fire retardant drops to slow the fire plume progression until ground fire department forces implemented manual suppression. Direct manual fire attack is generally considered safe only when flame heights are less than 8 feet. Firefighting orders were to fight the fire aggressively but safely.

Impacts

Ground fire department forces were effective where apparatus could access fire and direct manual firefighting efforts were possible. However, fire size, intensity, and speed of fire travel often made fire suppression impracticable or unsafe for firefighters, and manual wildland fire suppression by ground firefighters could not be implemented. In addition, suppression along SR 24 and other locations could not be made due to inaccessibility problems around ravines and canyons where apparatus cannot travel. After the fire initiated and grew south of SR 24, fire department apparatus could not easily access and deploy fire suppression resources due to terrain difficulties, and they had to go around to get at fire. This may have been a factor in how the fire grew to it size. Aerial fire suppression was effectively used to slow fire progression.

Fire Barrier Analysis

State Route 240 as a Barrier Against Fire

Barrier

Prevention- precut firebreaks and/or burn tumbleweed and vegetation along state right-of-way shoulder between SR 240 and the DOE fenceline.

Discussion

Precut firebreaks, "green belting" and/or burning off vegetation along right of way may have separated fire from spreading to DOE property.

Evaluation Failed/Success

Failed-The barrier was last maintained in 1995 by a controlled burn. Additional firebreaks were cut along portions of SR 240 during fire event, but the fire jumped the breaks.

Analysis

While this barrier (shoulder right-of-way vegetation burn off) was last time in place in 1995, it was not maintained. Vegetation reseeded enough to permit the fire ready available fuel to spread from the vehicular highway fire to vegetation on the Site. Because the fire started along SR 24 and the fire was massive in size, intensity, and speed by the time it reached SR 240, maintenance of the SR 240 barrier most likely may not have prevented the fire from crossing over SR 240.

Impacts

See Impacts for SR 24 barrier. Because the fire started along SR 24 and the fire was massive in size, intensity, and speed by the time it reached SR 240, maintenance of this barrier may not have prevented the fire from crossing over SR 240. However, if the accident had occurred along SR 240 and the barrier were maintained, a large range fire would be expected to be prevented. Firebreaks are most effective when wind conditions are less than 20 mph. The 24 Command fire exhibited what wildland firefighting professionals call "plume-dominated" behavior. This occurs when the fire creates its own wind, coupled with atmospheric wind conditions and the abundance of dry vegetation to burn. As flames reach over 10 feet high, vegetation debris and burn particles are lofted up and away from the flame front to as much as a half-mile ahead of the fire front, igniting a newer fire front. Precut firebreaks along SR 240 would not necessarily stop a plume-dominated fire in a high-wind condition.

Fire Barrier Analysis

State Route 240 as a Barrier Against Fire

Barrier

Suppression

Discussion

Manual fire suppression alone major road ways via fire department rolling stock and firefighters supplemented by aerial vehicular fire retardant drops.

Evaluation Failed/Success

Not successful; in most locations, impossible. The wind, coupled with the dry vegetation, accounted for the tremendous speed and intensity with which the fire traveled.

Analysis

Manual fire suppression of wildland fuel was not successful in most locations along SR 240 due to wind speed coupled with extreme amounts of dry vegetation, low fuel moisture,and fire intensity along the highway. Flame lengths of 20 to 30 feet ignited fires as much as a mile ahead of the fire front. These conditions made it impossible and unsafe for firefighters to perform direct suppression attack along SR 240.

Impacts

Fire size, intensity, and speed of fire travel made direct-attack fire suppression along SR 240 unsafe for firefighters, so manual wildland fire suppression by direct attack of ground firefighters could not be implemented. Aerial fire suppression was not fully effectively to stop fire progression across SR 240 due to high wind speeds, which carried buoyant burning particles across the highway. (Note: In other locations near HAMMER, LIGO, and Route 4, aerial fire suppression was effectively used to slow fire progression). The fire spotted out across SR 240 onto the Site at approximately 3:30 p.m.

Fire Barrier Analysis

Hanford Structures as a Barrier Against Fire

Barrier

Prevention- most all Hanford facilities and critical storage areas maintain defensible clearances around the facility. Facilities also have Underwriters Laboratories Class A roof decks and are built of either noncombustible exteriors or fire-resistive materials.

Discussion

To prevent wildland fires from exposing structures to fire, it is important to maintain defensible spaces around Hanford structures. Defensible clearances include mowed green grass areas, concrete walkways, asphalt areas, and graveled areas around facilities. The spaces are clear of natural vegetation, planted vegetation and trees, and other combustible materials and debris. In addition, to prevent air-lofted burning particles from igniting structural roofing components, RL still requires that all roofing be constructed with the following: Underwriters Laboratories Class A roofing and FM Class I roofing. System. (DOE 6430.1A, Section 0722).

Evaluation Failed/Success

Success

Analysis

Maintaining defensible firebreaks around facilities and critical storage areas including removal of debris and natural vegetation, providing green grass areas, concrete walkways, asphalt areas, and graveled areas around facilities and storage areas prevents fire continuity and travel to the facility structure and storage areas. Maintaining UL Class A roofing on a facility provides the most effective roofing system to resist exposure to air-lofted burning particles resulting from a wildland fire.

Impacts

The maintenance of defensible firebreaks around facilities and storage areas and having roofing systems for facilities that meet UL Class A and FM Class I roofing requirements provide the highest degree of protection against wildland fire.

Fire Barrier Analysis

Hanford Structures as a Barrier Against Fire

Barrier

Suppression- most all major DOE structures at Hanford are protected with automatic fire suppression systems.

Discussion

Fire suppression systems are installed inside all major Hanford facilities to provide fire control and suppression in the event of fire.

Evaluation Failed/Success

Not applicable. No fire suppression system was activated during the wildland fire.

Analysis

Fixed automatic fire suppression systems are intended to minimize the effects of fire starting inside facilities. They are not intended to minimize the effects of a wildland fire. The most effective method to protect against wildland fires is to maintain defensible barriers around facilities and storage areas.

Impacts

Automatic fire suppression systems are not intended to minimize the effects of a wildland fire. The most effective method to protect against wildland fires is to maintain defensible barriers around facilities and storage areas.

Fire Barrier Analysis

Change Analysis

Condition #1

SR 240 SR 24 [Failed]

Condition #2

Structure Barrier [Success]

Difference

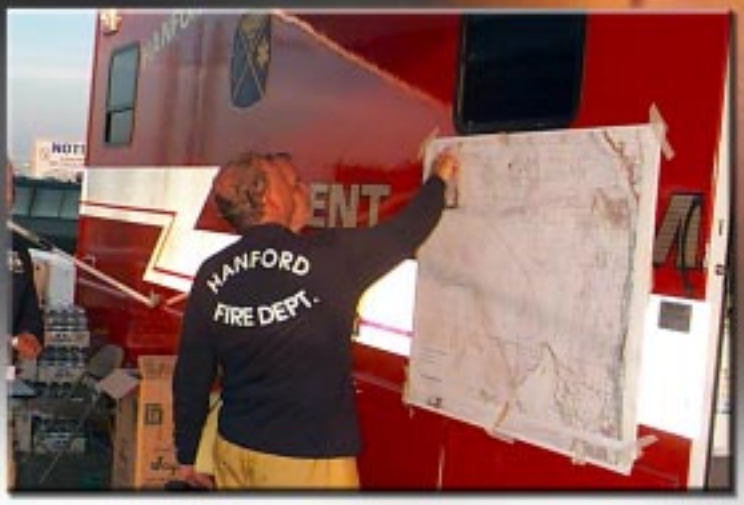
The SR 240 and SR 24 barriers failed because they were not maintained to provide adequate separation from natural fuel fire propagation necessary for fire continuity. In addition, once the fire grew large in size and winds created dominant fire plumes, burning particles air-lofted from one side of SR 240 jumped to the natural vegetation on the other side of SR 240, extending the fire. Structure barriers were successful for two reasons. First, defensible firebreaks around facilities, including removal of debris and natural vegetation, providing mowed green grass areas, concrete walkways, asphalt areas, and graveled areas around facilities, prevented fire continuity and travel against the facility structure. Second, maintaining UL Class A roofing provided the most effective roofing system to resist exposure to air-lofted burning particles resulting from a wildland fire and ignition of the structure roof.

Analysis

Many factors may contribute to the spread of wildfire, including fuel arrangement, moisture content, wind, and amount of vegetation. The most significant factor in having a successful firebreak along the highways is the ability to contain and prevent products of combustion on one side of the barrier from igniting fuel on the other . High wind speed and fuel type often can result in a failed firebreak barrier along the highways. However, in the case of the 24 Command Wildland Fire, the firebreaks along the state right-of-way shoulder between SR 24 and the DOE fenceline were not maintained for reasons as discussed in the SR 24 and 240 barrier table impact column. On the other hand, the defensible barriers around the facilities and critical storage areas were maintained. That maintenance, coupled with the fire-resistant facility roofing material and system, protected Hanford Site facilities from the effects of the fire.

Impact

Maintenance of barriers along state routes and around facility structures and critical storage areas is paramount to minimize the consequences of a wildland fire.



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